Twin Beam Power Tube

GENERAL DATA

Electrical:

	Series	*Parallel*	
Heater, for Unipotential Cathode:			
Heater Arrangement	*Series*	*Parallel*	
Voltage (AC or DC)	12.6 ± 10%	6.3 ± 10%	volts
Current	1.125	2.250	amp
Transconductance (Each unit) for dc plate volts = 250, dc grid No.2 volts = 175, and dc plate ma. = 60		8500	μmhos
Mu-Factor, Grid No.2 to Grid No.1 (Each unit) for dc plate volts & dc grid No.2 volts = 225, and dc plate ma. = 60		9	
Direct Interelectrode Capacitances (Each unit):			
Grid-No.1 to plate[a]		0.12 max.	pf
Grid No.1 to cathode & grid No.3, grid No.2, and heater		14.5	pf
Plate to cathode & grid No.3, grid No.2, and heater		7.0	pf
Grid-No.2-to-Cathode Capacitance including internal grid-No.2 bypass capacitor (Approx.)		65	pf

Mechanical:

Operating Position . . . . .Vertical, base up or down; Horizontal, plane of each plate vertical
Overall Length . . . . 4-1/8" ± 3/16"
Seated Length . . . . 3-11/16" ± 3/16"
Maximum Diameter . . . . 2-3/8"
Bulb T16
Bulb Terminals . . . . See *Dimensional Outline*
Base . . . . . Medium Molded-Flare Septar 7-Pin (JEDEC No.7-2)
Basing Designation for BOTTOM VIEW 7BP

Pin 1 - Heater
Pin 2 - Grid No.1 of Unit No.2
Pin 3 - Grid No.2
Pin 4 - Cathode, Grid No.3
Pin 5 - Heater Center-Tap
Pin 6 - Grid No.1 of Unit No.1
Pin 7 - Heater
P_{U_1} - Plate of Unit No.1
P_{U_2} - Plate of Unit No.2

AF POWER AMPLIFIER & MODULATOR — Class AB_1 [b]

Values are on a per-tube basis

Maximum CCS[c] Ratings, *Absolute-Maximum Values:*

DC PLATE VOLTAGE . . . . 750 max. volts

← Indicates a change.

DC GRID-No.2 VOLTAGE	225 max.	volts
MAX.-SIGNAL DC PLATE CURRENT[d]	250 max.	ma
MAX.-SIGNAL PLATE INPUT[d]	100 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT[d]	7 max.	watts
PLATE DISSIPATION[d]	30 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	235 max.	°C

Typical Operation:

DC Plate Voltage	600	volts
DC Grid-No.2 Voltage[e]	200	volts
DC Grid-No.1 Voltage[f]	-18	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	36	volts
Zero-Signal DC Plate Current	40	ma
Max.-Signal DC Plate Current	110	ma
Zero-Signal DC Grid-No.2 Current	6	ma
Max.-Signal DC Grid-No.2 Current	26	ma
Effective Load Resistance (Plate-to-plate)	13750	ohms
Max.-Signal Driving Power (Approx.)	0	watts
Max.-Signal Power Output (Approx.)	44	watts

→ PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER--Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1. Values are on a per tube basis.

Natural Cooling

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	*ICAS*[g]	
DC PLATE VOLTAGE	600 max.	600 max.	volts
DC GRID-No.2 VOLTAGE	225 max.	225 max.	volts
DC GRID-No.1 VOLTAGE	-175 max.	-175 max.	volts
DC PLATE CURRENT	212 max.	212 max.	ma
DC GRID-No.1 CURRENT	15 max.	15 max.	ma
PLATE INPUT	67.5 max.	90 max.	watts
GRID-No.2 INPUT	7 max.	7 max.	watts
PLATE DISSIPATION	21 max.	28 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	235 max.	235 max.	°C

Typical Operation with Natural Cooling:

DC Plate Voltage	600	425	600	volts

→ Indicates a change.



	CCS	ICAS		
DC Grid-No.2 Voltage:[h]				
From a grid-No.2 series resistor of:				
32000 ohms.	190	–	–	volts
11000 ohms.	–	200	–	volts
25000 ohms.	–	–	200	volts
DC Grid-No.1 Voltage:[j]				
From a grid-No.1 resistor of:				
15000 ohms.	-60	–	–	volts
43000 ohms.	–	-60	–	volts
8600 ohms.	–	–	-60	volts
Peak RF Grid-No.1-to-Grid-No.1 Voltage	138	160	144	volts
DC Plate Current.	112	212	150	ma
DC Grid-No.2 Current.	13	21	16	ma
DC Grid-No.1 Current (Approx.).	4	14	7	ma
Driving Power (Approx.)	0.3	1	0.5	watt
Power Output (Approx.).	50	63	70	watts

Forced-Air Cooling

Maximum Ratings, ***Absolute-Maximum Values:***

	CCS	ICAS	
DC PLATE VOLTAGE.	600 max.	600 max.	volts
DC GRID-No.2 VOLTAGE.	225 max.	250 max.	volts
DC GRID-No.1 VOLTAGE.	–175 max.	–175 max.	volts
DC PLATE CURRENT.	212 max.	240 max.	ma
DC GRID-No.1 CURRENT.	15 max.	20 max.	ma
PLATE INPUT	90 max.	120 max.	watts
GRID-No.2 INPUT	7 max.	8 max.[k]	watts
PLATE DISSIPATION	28 max.	40 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	100 max.	100 max.	volts
Heater positive with respect to cathode. . . .	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface). . .	235 max.	235 max.	°C

Typical Operation with Forced-Air Cooling:

DC Plate Voltage.	425	600	600	volts
DC Grid-No.2 Voltage:[h]				
From a grid-No.2 series resistor of:				
11000 ohms.	200	–	–	volts
25000 ohms.	–	200	–	volts
20000 ohms.	–	–	200	volts
DC Grid-No.1 Voltage:[j]				
From a grid-No.1 resistor of:				
4300 ohms	-60	–	–	volts
8600 ohms	–	-60	–	volts
5400 ohms	–	–	–70	volts
Peak RF Grid-No.1-to-Grid-No.1 Voltage.	160	144	180	volts

	CCS		ICAS	
DC Plate Current	212	150	200	ma
DC Grid-No.2 Current	21	16	20	ma
DC Grid-No.1 Current (Approx.) . .	14	7	13	ma
Driving Power (Approx.).	1	0.5	1.1	watts
Power Output (Approx.)	63	70	90	watts

PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR — Class C Telegraphy[m]
and
PUSH-PULL RF POWER AMPLIFIER — Class C FM Telephony

Values are on a per-tube basis unless otherwise specified

Natural Cooling

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	ICAS	
DC PLATE VOLTAGE	750 max.	750 max.	volts
DC GRID-No.2 VOLTAGE	225 max.	225 max.	volts
DC GRID-No.1 VOLTAGE	-175 max.	-175 max.	volts
DC PLATE CURRENT	240 max.	240 max.	ma
DC GRID-No.1 CURRENT	15 max.	15 max.	ma
PLATE INPUT.	90 max.	120 max.	watts
GRID-No.2 INPUT.	7 max.	7 max.	watts
PLATE DISSIPATION.	30 max.	40 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface) . . .	265 max.	265 max.	°C

Typical Operation with Natural Cooling:

	CCS	ICAS		
DC Plate Voltage	750	500	750	volts
DC Grid-No.2 Voltage:[n]				
From a grid-No.2 series resistor of:				
40000 ohms	190	-	-	volts
13000 ohms	-	200	-	volts
32000 ohms	-	-	200	volts
DC Grid-No.1 Voltage:[p]				
From a grid-No.1 resistor of:				
12500 ohms	-50	-	-	volts
3000 ohms	-	-45	-	volts
7200 ohms	-	-	-50	volts
From a cathode resistor of:				
360 ohms	-50	-	-	volts
170 ohms	-	-45	-	volts
270 ohms	-	-	-50	volts
Peak RF Grid-No.1-to-Grid-No.1 Voltage	116	128	124	volts
DC Plate Current	120	230	160	ma
DC Grid-No.2 Current	14	23	17	ma
DC Grid-No.1 Current (Approx.).	4	15	7	ma

Driving Power (Approx.)	0.3	0.9	0.4	watt
Power Output (Approx.)	70	83	90	watts

Forced-Air Cooling

Maximum Ratings, *Absolute-Maximum Values:*

	CCS	*ICAS*	
DC PLATE VOLTAGE	750 max.	750 max.	volts
DC GRID-No.2 VOLTAGE	225 max.	250 max.	volts
DC GRID-No.1 VOLTAGE	-175 max.	-175 max.	volts
DC PLATE CURRENT	240 max.	240 max.	ma
DC GRID-No.1 CURRENT	15 max.	20 max.	ma
PLATE INPUT	120 max.	150 max.	watts
GRID-No.2 INPUT	7 max.	8 max.	watts
PLATE DISSIPATION	40 max.	45 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max.	100 max.	volts
Heater positive with respect to cathode	100 max.	100 max.	volts
BULB TEMPERATURE (At hottest point on bulb surface)	235 max.	235 max.	°C

Typical Operation with Forced-Air Cooling:

DC Plate Voltage	500	750	750	volts
DC Grid-No.2 Voltage:[n]				
From a grid-No.2 series resistor of:				
13000 ohms	200	-	-	volts
32000 ohms	-	200	-	volts
27500 ohms	-	-	200	volts
DC Grid-No.1 Voltage:[p]				
From a grid-No.1 resistor of:				
3000 ohms	-45	-	-	volts
7200 ohms	-	-50	-	volts
4200 ohms	-	-	-50	volts
From a cathode resistor of:				
170 ohms	-45	-	-	volts
270 ohms	-	-50	-	volts
200 ohms	-	-	-50	volts
Peak RF Grid-No.1-to-Grid-No.1 Voltage	128	124	134	volts
DC Plate Current	230	160	200	ma
DC Grid-No.2 Current	23	17	20	ma
DC Grid-No.1 Current (Approx.)	15	7	12	ma
Driving Power (Approx.)	0.9	0.4	0.8	watt
Power Output (Approx.)	83	90	115	watts

[a] With external shield up to flange seal.

[b] Subscript 1 indicates that grid-No.1 current does not flow during any part of the input cycle.

[c] Continuous Commercial Service.

[d] Averaged over any audio-frequency cycle of sine-wave form.

[e] Obtained preferably from a separate source or from the plate-voltage supply with a voltage divider.

[f] The type of input-coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer or impedance coupling devices are recommended. When grid No.1 is operated in the negative region with fixed bias, the dc grid-No.1-circuit resistance should not exceed 100000 ohms. Cathode bias is not recommended.

[g] Intermittent Commercial and Amateur Service.

[h] Obtained preferably from a separate source modulated with the plate supply, or from the modulated plate supply through a series resistor.

[j] Obtained from grid-No.1 resistor or from a combination of grid-No.1 resistor with either fixed supply or cathode resistor.

[k] In ICAS applications at frequencies less than 20 Mc where duty factor does not exceed 0.2, maximum "on" period does not exceed 30 seconds, and average modulation factor does not exceed 0.25, maximum grid-No.2 input of 12 watts is permitted.

[m] Key-down conditions per tube without amplitude modulation. Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115 per cent of the carrier conditions.

[n] Obtained preferably from a separate source, or from the plate supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 829B is used in a circuit which is not keyed. Grid-No.2 voltage must not exceed 600 volts under key-up conditions.

[p] Obtained from fixed supply, by grid No.1 resistor, by cathode resistor, or by combination methods.

SHIELDING AND BYPASSING

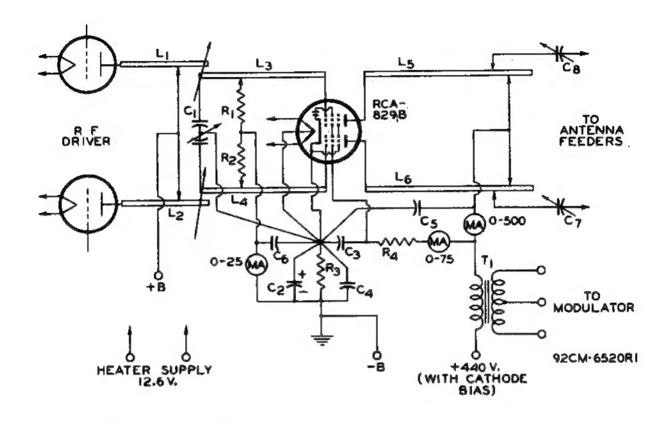
Shielding of the 829B in an rf amplifier is required for stable operation. A convenient method of shielding is to mount the tube with one end through a hole in a metal plate so that the edge of the hole is close to the internal shield of the tube. Due to the importance, at the very-high frequencies, of obtaining the shortest leads possible, rf bypassing must be accomplished close to the tube terminals. Ribbon leads acting as plates of the bypass capacitors are effective. All circuit returns should be made to the common cathode connection. RF chokes may be advisable in the voltage-supply leads.

MAXIMUM RATINGS vs OPERATING FREQUENCY

OPERATING FREQUENCY Mc	MAXIMUM PERMISSIBLE PERCENTAGE OF MAXIMUM-RATED PLATE VOLTAGE & PLATE INPUT	
	TELEPHONY	TELEGRAPHY
	Class C Plate-Modulated	Class C Unmodulated
200	100	100
250	89	89

VHF PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER

(OPERATING FREQUENCY APPROX. 200 Mc)



C_1 = 1.2 to 10 pf per section

C_2 = 25 µf, 200 Volts

C_3 C_4 C_5 C_6 = 500 pf, Mica

C_7 C_8 = 3 to 35 pf

R_1 R_2 = 7500 to 15000 Ohms, 1 Watt

R_3 = 60 Ohms, 10 Watts

R_4 = 6400 Ohms, 15 Watts

T_1 = Modulation Transformer

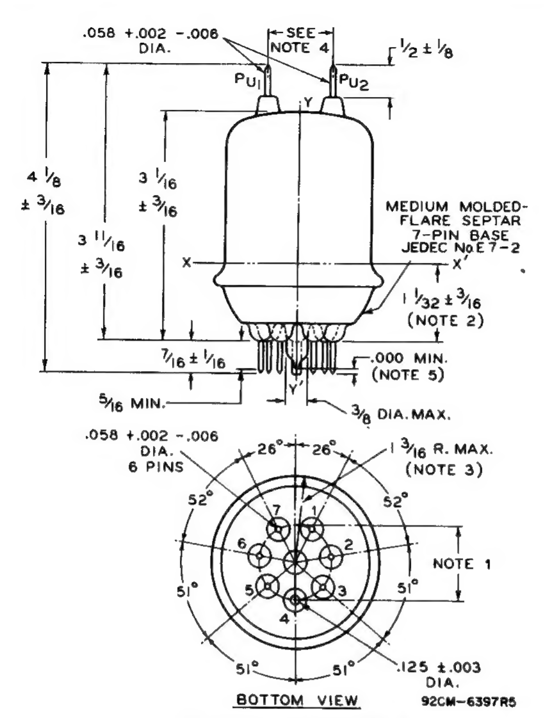
L_1 L_2 = Dimensions dependent on type of driver tube; Approx. same as L_5 L_6

L_3 L_4 = 1/4" Dia. coppertubing, approx. 10" long and spaced approx. 7/8" between centers.

L_5 L_6 = 3/8" Dia. copper tubing, approx. 7" long and spaced approx. 7/8" between centers.

NOTE 1: Adjust coupling of L_1L_2 and L_3L_4 for optimum grid excitation.

NOTE 2: Grid resistors should be adjusted on L_3L_4 at voltage node.



ALL DIMENSIONS IN INCHES

THE REFERENCE AXIS YY' IS DEFINED AS THE AXIS OF THE BASE-PIN GAUGE DESCRIBED IN NOTE 1.

NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 0.375" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ±5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS YY'.

NOTE 2: A FLAT-PLATE FLANGE GAUGE WITH HOLE 2.063" +0.003" -0.000" IS LOWERED OVER TUBE SEATED IN BASE-PIN GAUGE SO THAT THE HOLE AXIS IS COINCIDENT WITH AXIS YY' WITHIN 0.150", AND SO THAT THE BOTTOM SURFACE OF THE FLANGE GAUGE IS PARALLEL TO THE TOP SURFACE OF THE BASE-PIN GAUGE, AND UNTIL THE FLANGE GAUGE RESTS ON THE TUBE-FLANGE SEAL AT POSITION XX'. THE PERPENDICULAR DISTANCE BETWEEN THE TWO

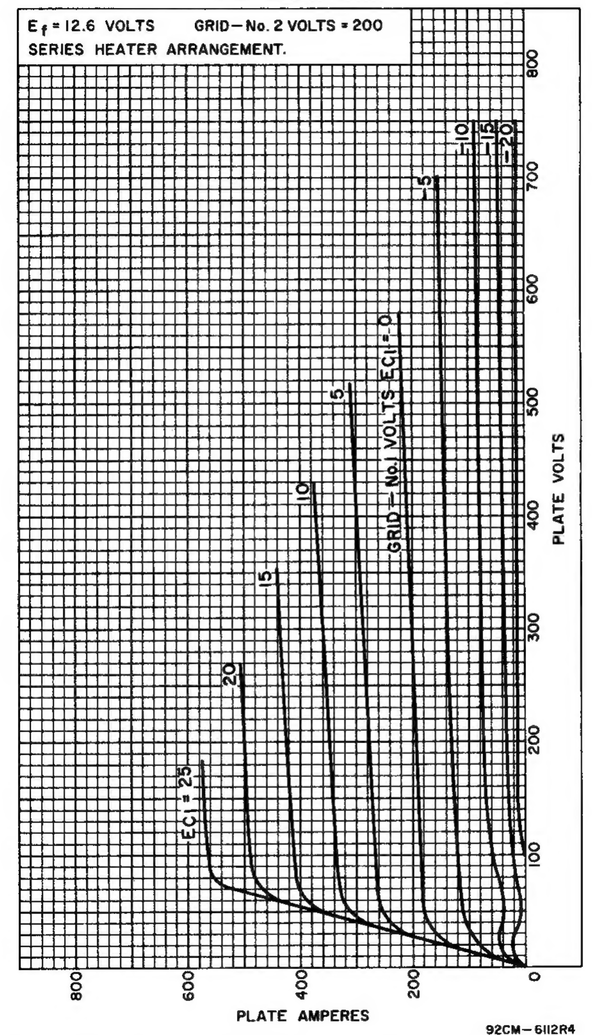
GAUGES WILL BE AS SHOWN.

NOTE 3: MINIMUM DIAMETER OF TUBE-SEAL FLANGE WILL BE SUCH THAT A RING GAUGE HAVING INSIDE DIAMETER OF 2.125" − 0.000" + 0.003" AND THICKNESS OF 0.125" ± 0.010" WILL NOT PASS THE FLANGE WHEN TRIED AT ANY ANGLE.

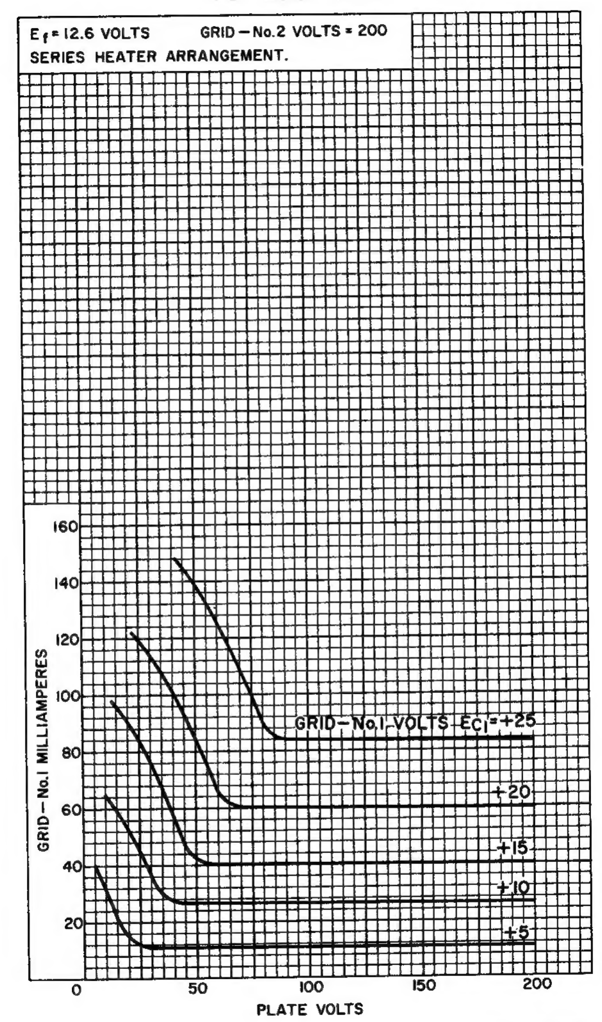
NOTE 4: THE PLATE LEADS WILL ENTER A FLAT-PLATE PLATE-LEAD GAUGE HAVING MINIMUM THICKNESS OF 0.375" AND HAVING TWO HOLES 0.1200" ± 0.0005" WHOSE CENTERS ARE LOCATED AT A DISTANCE OF 0.424" ± 0.001" FROM THE AXIS YY' AND WHOSE AXES ARE PARALLEL TO YY'. THE PLANE THROUGH THESE AXES WILL BE 90° ± 5' FROM THE PLANE THROUGH YY' AND PIN No.4.

NOTE 5: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.

TYPICAL CHARACTERISTICS
For Each Unit



TYPICAL CHARACTERISTICS
For Each Unit



TYPICAL CHARACTERISTICS
For Each Unit

